T. MELLARD READE.

BY the death of Mr. Thomas Mellard Reade, F.G.S., geological science has lost an amiable, painstaking, and enthusiastic geological worker. Educated as a civil engineer, he was at one time chief draughtsman in the civil engineering department (northern division) of the London and North-Western Railway. Later on he became engaged in independent engineering and architectural work, and was elected an Associate Member of the Institution of Civil Engineers and a Fellow of the Royal Institute of British Architects. In the course of his professional work, the strata exposed in foundations and trenches aroused his interest, and, recognising the practical advantages of a knowledge of geology, he began, when about thirty-five years of age, to pursue the study with great earnestness. The list of his scientific papers and works, numbering about 200, commenced in 1870 and continued until the present year. Residing in the neighbourhood of Liverpool, his attention was in earlier years given especially to the Glacial and post-Glacial deposits of Lancashire and Cheshire, and he was ever an advocate of the glacio-marine origin of much of the Boulder-drift.

Mr. Reade became a Fellow of the Geological Society of London in 1872, and was also an active member of the Liverpool Geological Society, of which he was three times president. His more important papers were communicated to these societies, and to the *Geological* and *Philosophical Magazines*, while many short contributions (dating from 1870) were published in NATURE. He extended his researches on Glacial geology into North Wales, Norfolk, Scotland, and Ireland. Tidal action as a geological cause, chemical denudation in relation to geological time, and the physiography of the Trias are among the subjects with which he dealt. In 1886 he published his great work on "The Origin of Mountain Ranges considered Experimentally, Structurally, Dynamically, and in Relation to their Geological History." The results of much original and experimental research were given in this volume, and the existence of a level-of-no-strain in a cooling solid globe was for the first time pointed out. It was recognised that his experiments on the rates of expansion of different kinds of rock were of great interest and value, although they did not explain some of the more complicated phenomena of mountain structure. In recognition of this work and other researches, the Geological Society in 1896 awarded him the Murchison medal.

Pursuing the subject of dynamic geology, and making further experimental investigations, he published in 1903 a volume entitled "The Evolution of Earth Structure, with a Theory of Geomorphic Changes." In this work he embodied much material which he had previously published, including researches on slaty cleavage, carried out in conjunction with Mr. Philip Holland, as well as essays on denudation and on the permanence of oceans and continents; and the volume may be said to summarise his main contributions to geological science. He expressed his conclusion that while the relative proportions of land and water have been fairly constant throughout the ages, regional changes of level are due to alterations in the bulk of certain portions of the lithosphere caused by expansion and contraction, without other movements in mass. Among his later investigations, those on "Sands and Sediments," in which he had the cooperation of Mr. P. Holland, are of great interest and importance, especially in connection with the micro-sediments, such as quartz-dust, and fine particles of carbonate of lime of detrital origin. In the latter case the suggestion is made that some deep sea-limestones may be due in part to mechanical causes.

Mr. Reade died on May 27, aged seventy-seven, at his residence, Park Corner, Blundellsands, Liverpool.

H. B. W.

NOTES.

THE Croonian lecture of the Royal Society will be delivered on Thursday, June 10, by Prof. E. A. Schäfer, F.R.S., on "The Functions of the Pituitary Body."

THE statue of Lamarck, erected by international subscription, is to be unveiled in the Jardin des Plantes, Paris, on Sunday, June 13, at 3 p.m. M. Fallières will preside at the meeting.

THE death is announced of M. Eugène Grenet, well known as an electrical engineer and the inventor of the potassium bichromate cell.

PROF. IRA REMSEN, president of the Johns Hopkins University, Baltimore, U.S.A., has been elected president of the Society of Chemical Industry for the ensuing year. The next annual meeting of the society will be held in Glasgow.

IT is announced that the principal trustees of the British Museum have appointed Mr. Lazarus Fletcher, F.R.S., keeper of the department of mineralogy, to the post of director of the natural history departments of the British Museum.

THE New York correspondent of the *Times* announces that the American delegates to the Darwin centenary celebration at Cambridge will bring with them a bronze bust of the great naturalist, 40 inches in height, which they will present to Christ's College.

IT is announced in *Science* that the American Academy of Arts and Sciences has awarded the Rumford premium to Prof. R. W. Wood, of the Johns Hopkins University, for his discoveries in light, and particularly for his researches on the optical properties of sodium and other metallic vapours.

MR. HORACE DARWIN, F.R.S., has been elected a corresponding member of the Vienna Academy of Sciences.

THE annual meeting of the Cape Chemical Society was held on April 30, when the following officers for 1909 were elected:—*president*, Dr. R. Marloth; *vice-president*, Dr. C. F. Juritz; *hon. secretary and treasurer*, Mr. St. Clair O. Sinclair; *additional members of council*, Mr. G. N. Blackshaw and Prof. P. D. Hahn. Dr. R. Marloth delivered his presidential address, on "The Chemistry of some Vegetable Products of South Africa."

AT the last meeting of the International Physiological Congress, which was held at Heidelberg in 1907, it was decided to hold the next congress at Vienna in 1910, at Whitsuntide. It has been found, however, that at this time of year it would be impossible for a large number of physiologists to attend the congress, and the local committee of the congress at Vienna has therefore, after consulting the local secretaries in the various countries, determined to change the date. In accordance with the general wish, the congress will now be held on September 26–30, 1910.

ON July 1 the price of the *Astrophysical Journal* is to be increased. In a letter upon this change, Prof. E. B. Frost, the managing editor, points out that a periodical of a strictly scientific character like the *Astrophysical Journal*, even though conducted without expense for contributions or for editorial or clerical assistance, cannot be self-supporting The annual deficit of the journal has been met by a subsidy from the University of Chicago, which in the last two years has been 400*l*., but no increase in this subsidy can be expected. With the advance in subscription price it is expected that the size of the journal and the number of illustrations will be maintained as during recent years.

THE fifth congress of the International Association for Testing Materials is to be held, under the patronage of King Frederick VIIIth of Denmark, on September 7–11 in Copenhagen. After the ceremonial opening of the congress on September 7, in the presence of the King of Denmark, and an address by the Prime Minister, Mr. Paul Larsen will read a paper on the development of the cement industry in Denmark. The three following days will be devoted to meetings of the sections, and on September 11 a paper will be read by Mr. J. E. Stead, of Middlesbrough, on the practical use of the microscope in testing metals and alloys. The latest date at which applications to take part in the congress can be received is June 15, and application should be made to the secretary of the Iron and Steel Institute at 28 Victoria Street, London, S.W.

WE regret to see the announcement of the sudden death of Dr. J. D. E. Schmeltz, director of the Royal Ethnographical Museum at Leyden, at seventy years of age. From the *Times* we learn that Dr. Schmeltz was a native of Hamburg, where he made the acquaintance of a wealthy merchant, Herr Godeffroy, an enthusiast in geographical and ethnological studies. Godeffroy founded an ethnographical museum in 1863, and made Schmeltz director. When in 1882 the Godeffroy Museum was sold, Schmeltz had a name sufficient to secure immediate nomination as conservator of the Leyden Museum of Ethnography, of which establishment he was appointed director in 1897.

DISTURBANCES, said by daily papers to be due to earthquakes, were reported from Tiverton and the surrounding district on May 25. They began at 12.54 p.m., and continued for twenty minutes, causing windows to rattle and houses to shake. They were preceded by a noise like thunder. The long interval throughout which the shocks were noticed, the apparent transmission of the waves through the air, and the fact that some observers remarked on the likeness between the disturbances and those caused by distant gun-firing, pointed to this as their cause. Inquiries have now shown that the supposed earthquakes were of artificial origin. They were caused by the firing of heavy guns in the Channel off Weymouth, about fifty miles from Tiverton. The disturbances at places nearer the centre, such as Dorchester and Yeovil, were, of course, assigned at once to their true cause.

IN connection with the annual grant voted by Parliament in aid of scientific investigations concerning the causes and processes of disease, Mr. Burns, the President of the Local Government Board, has authorised the following special researches:—(1) a continuation of the investigation into protracted and recurrent infection in enteric fever, by Dr. T. Thomson, in conjunction with Dr. Hedingham; (2) a continuation of the investigation into protracted and recurrent infection in diphtheria, by Dr. T. Thomson and Dr. C. J. Thomas; (3) a continuation of the investigation into flies as carriers of infection, by Dr. Monckton Copeman and Prof. Nuttall; (4) a continuation of Dr. Andrewes's investigation on the presence of sewage bacteria in sewer air, with the view of ascertaining their number and the distance they can be carried by air currents; also a continuation of Dr. Andrewes's investigation into the part played by changes in bone marrow in the defensive mechanism of the body against infection; (5) a continuation of Dr. Savage's investigations on the bacterial measurement of milk pollution, and on the presence of the Gaertner group of bacilli in prepared meats and allied foods; (6) an investigation into the chemical and physical changes undergone by milk as the result of infection by bacteria, and into the relation of the pancreas to epidemic diarrhœa, by Dr. Schölberg and Mr. Wallis; (7) an investigation of the records of charitable lying-in hospitals as to the nutrition of the mother and other factors influencing the vitality of infants and their progress in the first fourteen days of life, by Dr. Darwall Smith; (8) an investigation into the occurrence and importance, in relation to treatment, of mixed infections in pulmonary tuberculosis, by Dr. Inman; (9) an investigation on the relative importance of certain types of body-cells in defence against the tubercle bacillus, and the effect of tuberculin and other remedial agents on their activities, by Dr. J. Miller.

COUNT ZEPPELIN is reported to have beaten every existing record in the navigation of steerable balloons. On the evening of May 29, at 9.45, the ascent of the airship *Zeppelin II.* took place from Friedrichshafen, and the descent at Göppingen was made, in order to obtain a fresh supply of petrol, during the afternoon of May 31, when the cruise had lasted 37h. 40m. The *Times* of June 2 gives the following bee-line analysis of the voyage:—

Outward Journey (against wind).

	Distance Miles	Time Hours	Average Speed. Miles per hour
Friedrichshafen to Ulm	60	5	12
Ulm to Nuremberg	86	6	14
Nuremberg to Plauen	85	5	17
Plauen to Leipzig	60	3½	17
Leipzig to Bitterfeld	20	2½	

Return Journey.

	Distance Miles	Time Hours	Average Speed. Miles per hour
Bitterfeld to Halle	18	½	36
Halle to Weimar	45	1½	30
Weimar to Würzburg	105	7¾	13
Würzburg to Stuttgart	80	5	16
Stuttgart to Göppingen	25	1	25

The bee-line distance for the whole journey is 584 miles, and the total distance travelled was probably nearly 900 miles. Taking the running time as thirty-eight hours, and the distance 870 miles, the average speed works out at 23 miles an hour.

THE sixteenth International Medical Congress is to be held in Budapest from August 29 to September 4 next, under the patronage of the Emperor Francis Joseph, who will be represented by Prince Joseph. The formal opening will be held in the morning of Sunday, August 29. The business of the congress will consist largely of sectional meetings, the sections being as follows:—(1) anatomy and embryology; (2) physiology; (3) general and experimental pathology; (4) microbiology (bacteriology) and pathological anatomy; (5) therapeutics (pharmacology, physical therapeutics, and balneology); (6) internal medicine; (7) surgery; (8) obstetrics and gynæcology; (9) ophthalmology; (10) diseases of children; (11) diseases of the nervous system; (12) psychiatrics; (13) dermatology and venereal diseases; (14) diseases of the urinary tract; (15) rhinology and laryngology; (16) otology (this section forming also the eighth International Otological Congress); (17) stomatology; (18) hygiene and immunity; (19) juridical medicine; (20) military and naval sanitary services; and (21) maritime medicine and tropical diseases. There will be six general meetings of the congress, when the following subjects will be dealt with. Dr. G. Baccelli, of Rome, will discourse on heroic medicine; Dr. E. F. Bashford, of London, on cancer; Dr. M. Gruber, of Munich, on inheritance, selection, and hygiene; Dr. R. Kutner, of Berlin, on the post-graduate instruction of medical men, his address being given at the request of the central committee of Prussian post-graduate instruction; Dr. A. Laveran, of Paris, on tropical medicine; and Dr. J. Loeb, of Berkeley, on artificial parthenogenesis and its bearing upon the physiology and the pathology of the cell. The first issue of the Journal of the congress will give particulars as to the place, the day, and the time of each of these meetings. The executive committee of the congress has also arranged general meetings for the discussion of the reports and communications dealing with the subjects of appendicitis and immunity. It is interesting to note that 408 addresses and 781 communications, covering every branch of medical science, had been received at the time of the publication of the circular we have received from Budapest. The office of the congress is viii., Esterházy-utcza 7, Budapest, Hungary.

To Messrs. John Wheldon and Co., of Great Queen Street, we are indebted for a copy of a catalogue of works and papers on vertebrates, exclusive of birds, marine biology, &c., including selections from several libraries.

IN the thirty-seventh annual report of the board of directors of the Zoological Society of Philadelphia reference is made to the good results which have attended the testing with tuberculin of each monkey received at the gardens before its entrance to the quarantine-room. There has been no death from tuberculosis among the monkeys exhibited since October, 1907, and the results of the experiment justify the belief that, apart from an occasional sporadic instance, the disease can be held in check, and the heavy mortality due to this cause finally stopped.

To the May number of the *Zoologist* Captain S. S. Flower contributes a list of the known zoological gardens of the world; the total number recorded is 154, of which, however, a few appear to have been closed, while information is required concerning a few others. Of existing establishments of this nature, the oldest appears to be the Imperial Menagerie at Schönbrunn, Vienna, which was founded in 1752, the next in point of seniority being the menagerie at Madrid, dating from 1774, and the third that of Paris, founded in 1793.

FROM the report of the director of the Field Museum of Natural History, Chicago, for 1908, we gather the great progress that has been made in that museum (in common with other institutions of a like nature in the United States) in the mounting of groups of animals for public exhibition. During the year groups of woodchucks (marmots), musk-rats, and six of fishes have been added to the exhibition series in the Field Museum. The larger fish-groups are set up in cases 6 feet long by 20 inches in height and width, the specimens being mounted to give the effect, so far as possible, of live fishes under natural conditions.

A REVISION of the mice of the American genus Peromyscus, by Mr. W. H. Osgood, forming No. 28 of the "North American Fauna," now in course of issue by the U.S. Biological Survey, affords an instructive example of the elaborate and detailed manner in which that survey is being carried out. In this respect it is safe to say that it has no rival in any part of the world. We have only to look at the coloured map serving as a frontispiece, and illustrating the distribution of the races of *Peromyscus maniculatus* and its relatives, to realise the detailed nature of the survey's operations, and the enormous amount of collecting and technical work involved. Whether the game is really worth the candle need not now be discussed, and we may be content with congratulating Mr. Osgood and his co-labourers on the manner in which they have carried out their task, which is even now declared to be not finally completed. The members of the genus Peromyscus, commonly known as vesper-mice and white-food mice, include a vast number of species ranging over almost the whole of North America, and wonderfully numerous in individuals, and the group is therefore specially fitted for the study of the numerous problems connected with distribution, variation, and the limitations and intergradations of species and races.

Two articles have lately appeared in the *Fortnightly Review* under the title of "Suggestions for a Physical Theory of Evolution." The arguments of the writer are vitiated throughout by his implied assumption that the importance of the environment in evolution lies in its supposed power of directly inducing variation. The selective function of surrounding circumstances is passed over, and no serious attempt is made to deal with the essential differences that exist between somatic modification and variation properly so-called. The author commits himself to a "photographic" theory of the phenomena of mimicry and protective resemblance, ignoring the formidable difficulties that stand in the way of such an explanation. His treatment of this subject does not argue an adequate knowledge of the facts which he is endeavouring to explain.

AMERICA is by no means behindhand in celebrating the centenary of Darwin's birth. The April issue of the *Popular Science Monthly* is entirely devoted to a series of articles and addresses inspired by this occasion. Dr. H. F. Osborn leads the way with an excellent and appreciative lecture on the life and works of Darwin, in which, however, he avows opinions as to "directed variation" which would not have been acceptable to the object of his eulogy. Estimates of the influence of Darwin's work in the fields of zoology, botany, and geology are contributed by Dr. H. C. Bumpus, Dr. N. L. Britton, and Prof. J. J. Stevenson. Prof. T. H. Morgan's essay, "For Darwin," bases Darwin's claim to the gratitude of posterity chiefly on his method of investigation. This is inadequate; Darwin's preeminence consists in the revolution he has been the means of effecting in every department of thought; his method alone would not have singled him out from other great men. The substitution of the dynamic for the static conception of nature, of which Darwinism is at once a cause and a symptom, is well brought out by Prof. W. M. Wheeler, while the strength and nobility of Darwin's character and the distinctive features of his career and its results find a fitting interpreter in Prof. R. M. Wenley. The intensely interesting addresses given by Dr. A. R. Wallace and Sir Joseph Hooker at the Linnean Society's celebration, held last July, are added; and the record is completed by the insertion of a facsimile reproduction of part of the original manuscript of the "Origin of Species," together with portraits of Darwin himself, of Lyell, Hooker, Wallace, and Malthus.

THE Egyptian Gazette of April 21 supplies a report of a lecture delivered at the annual meeting of the Cairo Scientific Society by Dr. Elliot Smith, on the origin of the people of Egypt. He explained that the theories of the earlier anthropologists have now been in a large measure superseded by recent investigations of prehistoric interments, which have now rendered it possible to arrange archaic burials in systematic order. The earliest inhabitants of Egypt with whom we are acquainted were a people slightly below the average height of mankind and of poor muscular development. While they conform to the south European and Arab type, they are more closely allied to the Berbers of the southern shores of the Mediterranean. No remains of any population of like age having been as yet discovered in any neighbouring country, it seems clear that their culture was evolved in the Nile Valley, which they must have occupied at a period long antecedent to the earliest remains so far discovered. With the rise of the first dynasty a definite change sets in, the head becoming broader and more filled out, the nose narrower, and the physique improved. Little is known of the origin of this new race, but it seems probable that the original purely Egyptian population of Lower Egypt was modified by the immigration of alien elements entering the delta from the islands or northern shores of the Mediterranean, or wandering along the southern shores of that sea from Libya on the west or from Palestine on the east. The original type was, however, only slightly modified during the Ancient Empire, and at all times large numbers of persons of the pre-dynastic type are found. The modification really set in with the rise of the New Empire. In Nubia the case was different. Here the original type survived in early dynastic times unaffected by the immigration which made its mark in Lower Egypt; but instead of this influence the race here became subject to another—that of the negro. The Nubian is thus the descendant of pre-dynastic Egyptians slightly mixed with the negro, while the Egyptian of the delta represents the same primitive stock somewhat modified by intermixture with some Mediterranean people.

THE most important paper in the current issue of the Journal of the Royal Anthropological Institute is that by the president, Prof. Ridgeway, on the origin of the Turkish crescent. So far from being an ancient Mohammedan symbol, it was not employed by the Arabs or by any of the original nations who embraced the faith of the Prophet, nor was it borne by the Saracens who fought in the Crusades. It was not identified with Islam until after the appearance of the Osmanli Turks, and there is ample evidence that in the time of the Crusades, and long before, the crescent and the star were a regular badge of Byzantium and of its emperors. Comparing the crescent with similar forms of ornament used by other races, Prof. Ridgeway comes to the conclusion that the Turks derived it from two sources, the old amulet made of one or two boars' tusks, and the crescent and star which they found everywhere in their new empire. Without denying that representations of the moon may have been made and venerated by the inhabitants of the Swiss lake-villages, and that, in some regions and in some periods, the crescent of boars' tusks was likened to the new moon, still, with the evidence of Spartan and Danubian metal imitations of boars'-tusk amulets before us, we may conclude with some safety that the use of crescents of boars' tusks and of imitations of these was far older in the regions ruled by the emperors of Byzantium than the badge of crescent moon or star. It may well be that the latter was adopted by the emperors of the East from the Star of Bethlehem. The Turks probably became acquainted with the boar, and used its tusks as an amulet after their settlement in Asia Minor. In their standard, consisting of the crescent and horse-tail, we may perhaps recognise only another form of the amulet of badger's hair and teeth of wild beasts used now in Italy to protect horses from the Evil Eye.

THE annual statement, in this case for two years, of the collated series of phenochrons, *i.e.* the earliest observed dates of opening flowers and other natural phenomena, compiled from data supplied by a large number of schools in Nova Scotia and Canada, is published as a report of the Botanical Club of Canada by Dr. A. H. Mackay. The report would be more generally useful if the observations were summarised and a general comparison made with the data of preceding years.

THE mode of formation of balls of weed made by the rolling action of water, both in lakes and in the sea, is discussed by Dr. A. H. Mackay in vol. xi., part iv., of the Proceedings and Transactions of the Nova Scotian Institute of Science. It is suggested that the deposition of a mass of molluscan or other eggs on a basis of seaweed might, by furnishing agglutinate matter, start the formation of such a weed-ball; but in other instances roots of algas serve as a nucleus, while in some cases the whole structure consists of the finer kinds of brown algas.

A CONTRIBUTION, by Dr. S. Yamanouchi, to the cytology of Fucus, dealing chiefly with the first and second nuclear divisions in the oogonium and with the antheridium of *Fucus vesiculosus*, appears in the *Botanical Gazette* (March). The details of the mitoses, with numerous excellent figures, are given, but a full discussion of the fertilisation process is reserved. Regarding the number of chromosomes, it is found that sixty-four chromosomes are present in the Fucus plant, and that the reduction to half that number occurs at the end of the first two nuclear divisions in the oogonium and antheridium initials. Each of the four nuclei then produced contains thirty-two univalent chromosomes, and this persists to the sperm and egg.

AN account of the vegetation in and around the Redrock Lake, Colorado, published in the University of Colorado Studies (vol. vi., No. 2) by Dr. F. Ramaley, is interesting since the lake is situated at an altitude of about 10,000 feet, and the growing period is limited to a few months. Four zones are demarcated; *Nymphaea polysepala* provides the most abundant aquatic type, while *Carex utriculata*, with other species of Carex and *Caltha leptosepala*, are conspicuous in the sedge zone. The willows and *Betula glandulosa* are dominant in the shrub zone, beyond which the forest area lies, where *Picea Engelmanni* forms almost pure stands in wetter localities and *Pinus flexilis*, with *Pinus murrayana*, dominate the drier situations; *Vaccinium oreophilum* is the most characteristic undershrub in the woods.

MAY usually has a large amount of bright sunshine, but this year it has beaten all previous records, not only for the corresponding month, but for any month since the sunshine records for London were started in 1880. The duration of bright sunshine was 297 hours at the reporting station of the Meteorological Office in Westminster, and the previous highest record for May is 237 hours, in 1906, whilst the previous highest record for any month in the year is 261 hours, in July, 1900. At Greenwich the duration of bright sunshine for May was 326 hours, which is 140 hours more than the average, and in April there was an excess of 103 hours, making a total excess of 243 hours for the two months. In May there were seven days with more than fourteen hours of bright sunshine, and there have only been two days without sunshine during the last two months. At some places in the south of England the sun was shining in May for 350 hours. The aggregate duration of sunshine since the commencement of the year is largely in excess of the average over the whole of England, the excess for the twenty-one weeks amounting to more than 200 hours in the south-east of England.

AN important contribution to the study of the upper air, by Dr. W. Köppen, is published in *Aus dem Archiv der deutschen Seewarte*, vol. xxxi., part i., entitled "Three Years' Simultaneous Meteorological Kite Ascents near Hamburg, Berlin, and St. Petersburg." In order to throw light on the lateral extension of the warm and extremely dry strata met with in kite ascents, on the conditions of their occurrence and disappearance, and on their effect on weather changes, the author has collated, side by side, the results for each day during the period December, 1903, to November, 1906, on 108 diagrams, each containing ten days, and showing temperature, wind direction and velocity, and low conditions of humidity. The general discussion of this very useful synoptic material is left for future work; the author nevertheless directs attention to several interesting points. The inversions of temperature are specially noticeable, particularly those which occur suddenly, where the warm stratum borders almost immediately on the cold layer beneath; the temperature gradients in these remarkable inversions are often very large, and mostly occur in late autumn and in winter. The increase of wind velocity with height naturally differs with the direction and with season; all the curves show a rapid increase up to 500 metres, after which it becomes more gradual. The diagrams only include altitudes up to 4000 metres; between the ground and 3000 metres, at Hamburg, the general mean of the velocity (irrespective of direction) in metres per second is 16·7 in the summer half-year and 17 in the winter half-year, while at Berlin the velocities are 9·1 and 12·8 respectively. These special points are discussed by the author in considerable detail.

IN a pamphlet of twenty-seven pages published by Gauthier-Villars, of Paris, M. Jacques Boyer has recently given an admirable sketch of the work done of late years, especially in France, in the artificial production of precious stones. With respect to the formation of true rubies, some of which are quite undistinguishable from the natural stones, new and interesting information is given concerning the work accomplished by the successors of Fremy—Feil, Verneuil, Diener Wyse, Maiche, Michaud, and Marc Paquier—with photographs of the actual apparatus employed in the latest manufactures. While the reproduction of the ruby, of perfectly natural colour, has been so successful, much greater difficulty has been experienced in trying to imitate the sapphire, the actual source of the colour in this gem being more doubtful. M. Boyer, however, claims that excellent results have now been obtained by M. Disclyn and M. Louis Paris. In the reproduction of the varieties of quartz used as gems, it is interesting to learn that the different tints of the amethyst have been produced by the action of radium on the uncoloured mineral; and with regard to the opal and emerald information is given, though no results of commercial value have as yet been obtained. The work concludes with an account of what has been effected in the way of producing the diamond by artificial means, photographs of Moissan's electric furnace and other apparatus being given. A bibliography at the end of the paper is useful, but the work, though it contains much valuable and interesting information—sometimes on points upon which there has been much concealment—cannot be regarded as in any sense exhaustive.

PROF. J. TRAUBE, of Charlottenburg, has always been one of the most pronounced opponents of the dissociation theory of solution, and in the April number of *Ion* he shows how the idea of cohesion pressure, that is, the attraction exerted by the molecules of the dissolved substance on the molecules of the solvent, may be used to explain the properties of solutions, whether these are met with in physical, chemical, or physiological fields. Prof. Traube's paper should pave the way to a thorough discussion of the question of solutions. In the same number Dr. V. Kurbatov, of St. Petersburg, shows the inadequacy of the electronic theories of the conduction of electricity in metals, as stated in various forms by Profs. Drude, Lorentz, and Sir J. J. Thomson, to explain the facts observed. He gives an outline of his own theory which is based on the electronic constitution of matter, but he does not justify the assumptions on which he founds it. The translation of this paper is far from perfect.

SINCE flame spectra were first discovered two explanations have been offered as to their nature. According to one, they are the direct result of chemical reactions going on in the flame—the reduction of the metallic salt, in the opinion of Pringsheim—while the other regards them as the effect of the normal oscillations of the atoms at the high temperature of the flame. In the latter case the speeds of the atoms are distributed according to the law of Maxwell, in the former there will be regions of chemical action in which the speeds will be in excess of the normal. The experiments of Pringsheim, and more recently those of Fredenhagen, seem to support the chemical luminescence theory, while the work of M. E. Bauer, described in the April number of *Le Radium*, lends strong support to the pure temperature explanation. M. Bauer has measured the radiation and absorption of a large Mëker flame for sodium light and for the long rays produced by repeated reflections from fluorite ("reststrahlen"), and finds that Kirchhoff's law is followed, while the temperatures of the flame calculated from the two sets of observations agree very closely. The conclusion seems forced on us that temperature is the essential factor in the production of flame spectra, and if chemical action accounts for any of the radiation it does so only indirectly.

THE new 300-ton universal testing machine recently installed by Messrs. W. and T. Avery, Ltd., in the civil engineering laboratory of the University of Birmingham is described and illustrated in the *Engineer* for May 21. The machine is of the horizontal type, and can take exceptionally long specimens—under tension to a maximum stretched length of 33 feet 6 inches, and under compression up to a maximum length of 30 feet. An hydraulic pressure of 1000 lb. per square inch is supplied from an accumulator charged by a motor-driven pump, and advantage is taken of the city main pressure of 85 lb. per square inch for returning the straining cylinder ram and for low load tests. The weighing arrangement consists of a bell-crank lever connected to a second lever which in turn is connected to the steelyard. There are no loose weights; seven poises travel on the steelyard, each representing, when in extreme position, a load of 100,000 lb. on the specimen. These poises are traversed by means of a screw, and can be instantly engaged or disengaged. The machine, in the capable hands of Prof. Dixon, should turn out some useful and interesting results on the strength of built-up structures, for which it seems to be well adapted.

BULLETIN No. 362 of the United States Geological Survey, by Mr. J. S. Burrows, deals with the mine sampling and chemical analyses of coals tested at the United States Fuel-testing Plant in 1907. This is one of a series of papers dealing with work done at the fuel-testing station, work valuable to the coal owner, coal user, and to all interested in the scientific study of coal. The results of the examination of seventeen samples of Jamestown coals are given in this bulletin, including proximate and ultimate analyses and the experimentally determined calorific values. A list is given at the end of the previous survey publications on fuel testing.

BULLETIN No. 365 issued by the United States Geological Survey contains an interesting account of the fractionation of crude petroleum by capillary diffusion, by Messrs. J. E. Gilpin and M. P. Cram. When oil is allowed to rise by capillary attraction in a tube packed with Fuller's earth, there is a decided fractionation of the oil, the fraction at the top of the tube being of lower specific gravity than that at the bottom. There is a tendency for the paraffin hydrocarbons under these conditions to collect in the lightest fractions at the top of the tube, and the unsaturated hydrocarbons at the bottom. If the oil is mixed with Fuller's earth and then displaced with water, about one-third of the oil remains in the earth.

BRIQUETTE-MAKING formed the subject of a paper recently read before the South Wales Institute of Engineers by Prof. W. Galloway. Small coal cannot be burnt so economically in the furnaces of boilers in its original state as when in the form of briquettes, partly on account of so much of it falling through the fire-bars, and partly because the particles lie so closely together as to prevent the free access of the air required for combustion. Briquettes made exclusively with anthracite coal burn too slowly, and it is advisable to mix a certain proportion of bituminous coal to overcome this objection. Up to the present, no kind of agglomerating material other than pitch or resin, or a mixture of these, has given satisfactory results. Briquettes made with resin alone become soft and lose their shape in the fire; those having a mixture of 4 per cent. of pitch and 1½ per cent. of resin give better results. It is of interest to note that the total output in the United Kingdom in 1906 amounted to 1,513,220 tons, while Germany produced 14,500,851 tons of this fuel in the same year. The paper contains full descriptions and drawings of the mixing and drying machinery and presses required for briquette-making, together with estimates of labour required and costs. For example, at an English works making 102½ tons of briquettes per day of ten hours, the total cost, including labour, materials, fuel and stores, interest and depreciation, works out to 9*s*. 7·45*d*. per ton.

A RECENT paper by G. Jaffé in the *Annalen der Physik*, on the electrical conductivity of pure hexane, will possess considerable interest to those who are concerned with the *rôle* of the solvent in electrolysis, as well as to those who are working on the electrical conductivity of gases. The impure material owes much of its conductivity to electrolytic impurities, but these can be removed by electrolysis and by repeated distillation, when samples are obtained with a very minute but practically constant conductivity, about twelve times greater than that of air under similar conditions. The pure hydrocarbon, indeed, shows almost all the electrical properties of a gas of high density. How widely its properties differ from those of purified water or other feeble electrolytes may be seen from the fact that two-thirds of the conductivity vanishes when the measuring vessel is sheathed with lead in such a way as to cut off external radiations, and that the remainder of the conductivity is greatly influenced by the nature of the containing vessel, aluminium giving exceptionally low values. Two other remarkable points of contrast are (1) the constancy of the current at different temperatures, and (2) the fact that an increase of potential from 200 to 2000 volts produces no increase in the current, which reaches a "saturation" value analogous to those of gases, although at a much lower voltage.

OUR ASTRONOMICAL COLUMN.

ASTRONOMICAL OCCURRENCES IN JUNE:—

June 3.	11h. 43m. to 15h. 14m. Eclipse of the Moon, visible at Greenwich.
9.	20h. Mars in conjunction with Moon (Mars 2° 33′ N.).
12.	18h. Saturn in conjunction with Moon (Saturn 2° 13′ N.).
17.	12h. Sun eclipsed, invisible at Greenwich.
21.	8h. 22m. Transit (ingress) of Jupiter's Satellite IV. (Callisto).
,,	11h. 41m. Minimum of Algol (β Persei).
,,	14h. Sun enters Cancer, summer begins.
22.	18h. Venus in conjunction with Neptune.
,,	Saturn. Major axis outer ring = 39·78″, Minor axis = 8·85″.
23.	1h. Jupiter in conjunction with Moon (Jupiter 4° 21′ S.).
24.	9h. 15m. to 9h. 59m. Moon occults ν Virginis (4·2).

THE DISPERSION OF LIGHT IN INTERSTELLAR SPACE.—In the *Revue générale des Sciences* (No. 8, p. 350), Dr. Ch. Nordmann reviews the work recently performed by MM. Tikhoff and Belopolsky and himself on the dispersion of light in interstellar space. The results obtained in the first experiments have been questioned by a number of astronomers, and, in re-stating the case clearly, Dr. Nordmann disposes of many of the objections.

As has already been recorded in these columns, Dr. Nordmann's method consists in observing the difference, in time, of the minima of variable stars when screens of different colours are employed, whilst in the Tikhoff-Belopolsky method the dispersion is shown by the various displacements of lines in the different parts of the spectra of spectroscopic binaries.

It has been suggested that the observed differences may be due to physical changes in the binary system itself, but Dr. Nordmann argues that if this were the case the displacement of the curves for different parts of the spectrum would vary at different parts of the orbit, whereas if the displacement is due to dispersion in space it would be the same in all parts of the orbit. At present he is content that a matter of so great an importance to astronomers and physicists is re-opened, and would attach no rigorous significance to the quantitative results so far obtained; qualitatively they are in the right direction, and are in accordance with the results of ordinary refractive media. Should the validity of these results be established their importance in any cosmological discussion can scarcely be overestimated; for example, the determination of the distances of binary systems would become greatly simplified.

A REMARKABLE TRANSIT OF JUPITER'S THIRD SATELLITE.—No. 4324 of the *Astronomische Nachrichten* contains an account, by Mr Innes, of a remarkable transit of Jupiter's